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Clark Fork River Superfund Site Investigations

Pilot Data Report Addendum

ARCO
Anaconda, Montana

July 2000

Clark Fork River Superfund Site Investigations Pilot Data Report Addendum

ARCO
307 E. Park Street
Anaconda, Montana 59711

Prepared by

Exponent
4000 Kruse Way Place
Building Two, Suite 285
Lake Oswego, Oregon 97035

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Acronyms and Abbreviations

DQA	data quality assessment
DQO	data quality objective
DSR	data summary report
EPA	U.S. Environmental Protection Agency
MDEQ	Montana Department of Environmental Quality
NPL	National Priorities List
QA/QC	quality assurance and quality control
SAP	sampling and analysis plan
SOP	standard operating procedure

Statement of Authenticity

Consistent with the provisions of [reference appropriate agreement for performance of RI/FS or RD/RA], the following data sets are considered to be final data generated or evaluated. Data have been designated as enforcement quality and screening quality as described in the Clark Fork River Superfund site investigations quality assurance project plan (QAPP) and data management/data validation (DM/DV) plan as supplemented by addendum. Consistent with the aforementioned orders, the signatories below hereby stipulate to the authenticity and accuracy of the data and hereby waive any evidentiary or other objection as to the authenticity and accuracy of reference in endangerment assessments, public health evaluations, feasibility studies, and RD/RA documents.

Approved by: _____ _____

ARCO Representative (Name)
Montana Project Manager
AERL

Date

Approved by: _____ _____

EPA Remedial Project Manager (Name)
U.S. Environmental Protection Agency
Region VIII

Date

Approved by: _____ _____

MDEQ Project Manager (Name)
Montana Department of
Environmental Quality

Date

Executive Summary

This pilot data report addendum is a model report to be used as a guide in the preparation and production of a data summary report (DSR) that would typically be generated for Clark Fork River Superfund site investigations. The information included in each section of a DSR is summarized in this model report.

The following documents have been developed for all Clark Fork River Superfund site investigations: a laboratory analytical protocol (LAP) (ARCO 1992c), quality assurance project plan (ARCO 1992d), data management/data validation plan (ARCO 1992b) and Addendum (ARCO 2000), and standard operating procedures (SOPs) (ARCO 1992a). The procedures and requirements contained within these documents should be followed and referenced in all DSRs.

All DSRs will typically include quality assurance and quality control (QA/QC) reports as appendices. Project-specific data quality objectives (DQOs) established in the sampling and analysis plan (SAP) may include objectives regarding data validation and assessment (i.e., construction data will not be subjected to data validation). In such cases, the DSR will not include QA/QC report appendices summarizing the results of data validation and assessment.

The purpose of a data report is to be the primary reference to be consulted by all data users for the data presentation, usability, and validation information associated with an investigation. This first section, the executive summary, will contain a concise statement on the content of the specific data report. Three tables will be included in this section:

- Table 1 will contain all analytical data with an enforcement and screening assessment;
- Table 2 will contain the results of all samples collected (including field quality control results) with Level A/B assessment and laboratory-assigned flags and qualifiers; and
- Table 3 will include all sample identifier information.

Introduction

This report presents the results of _____ sampling and analysis for the _____ Investigation of the Clark Fork River Superfund site. The site is located within the National Priorities List (NPL) site and is the subject of the _____. Results from previous investigations are summarized in _____ **(insert references here)**. The information contained in this report was gathered following objectives and procedures documented in the _____ *Sampling and Analysis Plan* (SAP) (**Document reference**). Overall _____ objectives and requirements are outlined in the _____.

The following information (**as an example**) will be included in this data report:

- Results of field and laboratory analyses;

Description of field sampling methods; and

- Locations of all sampling stations.

The field notebook and field data sheets for this investigation are located at ARCO contractor offices in **City, State**.

A listing of specific areas that were investigated is included in this section. This data report summarizes data collected from these sampling stations during this investigation as well as data collected during previous investigations and contained within the historical database (**Document reference**). When applicable, a quality assurance and quality control (QA/QC) review of inorganic data collected for this investigation will be included in Appendix A.

Investigation Objectives

The objectives of the _____ Investigation, as outlined in the _____, were as follows:

- Specific objectives as detailed in the work plan or SAP will be listed here.

The results of this investigation supplement existing data contained within the historical database (**Document reference**). These data will be used in (e.g., evaluate the potential volume of materials to be removed, fill in data gaps . . .).

Data Quality Objectives and Assessment

The data quality objectives (DQOs) of the _____ Investigation, as outlined in the SAP (**reference**), were as follows:

- Specific objectives of the SAP will be restated here.

Results of the data quality assessment (DQA) are:

- Specific results of the DQA will be restated here.

DQA Process (U.S. EPA 2000)

Step 1: Review DQOs and sampling design
Step 2: Conduct preliminary data review
Step 3: Select statistical test(s), as appropriate, to evaluate data quality
Step 4: Verify assumptions
Step 5: Draw conclusions about the quality of data (data report will not include interpretation of results, but will state conclusions regarding the quality of the results).

Completeness of field collection will be included here. The narrative will include a discussion of the total number of stations occupied and samples collected, as compared to the objectives in the SAP. An explanation of stations that were not occupied and samples that were not collected will be presented. A table summarizing sample site locations and number of samples collected will be provided.

If, as a result of the DQA process, it is determined that data do not satisfy all DQOs, then corrective action(s) should be recommended. Corrective actions include, but are not limited to, revision of the DQOs or collection of more information or data. It may be determined that corrective actions are not required, or the decision process may continue with the existing data, with recognition of the limitations of the data.

Investigation Site Description

This section will list and discuss specific areas that were targeted for detailed sampling and analysis during the investigation. This section will also identify specific geographical features of the study areas. If maps were produced during the investigation, these maps would be discussed in this section.

Sampling and Analysis Summary

A summary of sample station locations, sample numbers, and analytical parameters will be presented in this section. Table 4 will include the coordinates of each sampling station. Sample station locations as shown on small-scale and oversize maps will be discussed. Actual analytical results will be contained in the area-specific sections that follow. The total number of sample stations and number of samples collected will be included in this section. A statement of where samples were analyzed (i.e., individual laboratory names) and the specific analytes will be included in this section. Specific information relating to the completeness of the data set will be included in the appendices to this report.

Samples are collected following procedures detailed in the SAP, except where modifications of the sampling design or procedures were required. Sample stations may be located in cooperation and agreement with the attending U.S. Environmental Protection Agency (EPA) oversight observer. In this case, provide a *Deviations from the Sampling and Analysis Plan* section. A general statement describing the sampling approach (e.g., backhoe pits, hand-dug pits) will be included in this section. Specific details on sample collection methods for each sample type will be provided in the following sections.

Specific Area Name

If specific areas (e.g., Anaconda community, regional community) are identified for investigation in the SAP, the sampling methods and analytical results, by area, will be discussed in this section. If specific areas of investigation were not identified in the SAP, this section will be deleted from the data summary report (DSR).

Sampling Methods

Sampling methods that were used will be discussed in this section, generally citing the respective SAPs for details.

Analytical Results

Analytical results for specific areas will be presented in this section. Tables containing data for each area sampled will be included. Data summary tables for the entire investigation with the screening/enforcement assessment and qualifiers are presented in the executive summary and should not be duplicated in this section.

Calculations

The procedures used for calculations (if any) will be discussed in this section. A table listing results of the calculations will be presented. Actual calculations will be reproduced in an appendix.

Deviations from the Sampling and Analysis Plan

Standard operating procedures (SOPs) for Clark Fork River Superfund site investigations have been compiled by ARCO (ARCO 1992a) and are to be followed for all field tasks. The following deviations from the _____ Investigation SAP were noted during the field sampling event and subsequent data processing:

- List deviations.

Approval for deviations provided by EPA field oversight personnel or other EPA/Montana Department of Environmental Quality (MDEQ) personnel should be referenced and included in this section.

References

A list of all references used in the data report will be included in this section.

The following documents are referenced in this pilot data report addendum (not including appendices)

ARCO. 1992a. Clark Fork River Superfund site investigations standard operating field procedures. Draft report. ARCO, Anaconda, MT.

ARCO. 1992b. Clark Fork River Superfund site investigations data management/data validation plan. Prepared by PTI Environmental Services. Bellevue, WA. ARCO, Anaconda, MT.

ARCO. 1992c. Clark Fork River Superfund site investigations laboratory analytical protocol. Prepared by PTI Environmental Services, Bellevue, WA. ARCO, Anaconda, MT.

ARCO. 1992d. Clark Fork River Superfund site investigations quality assurance/quality control project plan. Prepared by PTI Environmental Services, Bellevue, WA. ARCO, Anaconda, MT.

ARCO. 2000. Clark Fork River Superfund site investigations data management/data validation plan addendum. Prepared by Exponent, Lake Oswego, OR. ARCO, Anaconda, MT.

U.S. EPA. 2000. Data quality objectives process for hazardous waste site investigations. EPA QA/G-4HW Final. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC.

Table 1. Data summary with enforcement and screening assessment[a]

Sample Number	Arsenic (mg/kg)	Status[b]	Cadmium (mg/kg)	Status	Copper (mg/kg)	Status	Lead (mg/kg)	Status	Zinc (mg/kg)	Status

[a] This table should include results for natural field samples only. This table should **not** include results for field replicates, field blanks, or reference materials.

The following codes for data assessment should be used in this table and footnoted:
E - enforcement
R - rejected
S - screening

Table 2. Data summary with laboratory flag and qualifier codes

Sample Number	Level A/B Assessment	Arsenic (mg/kg)	Lab Flag[a]	Qual[b]	Cadmium (mg/kg)	Lab Flag	Qual	Copper (mg/kg)	Lab Flag	Qual	Lead (mg/kg)	Lab Flag	Qual	Zinc (mg/kg)	Lab Flag	Qual

Note: This table should include results for natural samples, field replicates, and field blanks. Footnotes for each laboratory flag and qualifier used in the table should be presented.

[a] Laboratory flag (assigned by the laboratory). Defined in U.S. EPA 1988. Contract Laboratory Program statement of work. Inorganic analysis, multi-media, multi-concentration. ILM04.0. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Las Vegas, NV:

- * - Laboratory duplicate results outside control limits
- + - Correlation coefficient for Method of Standard Additions (MSA) for GFAA less than 0.995
- E - Sample results qualified because of interference (graphite furnace atomic absorption [GFAA] analytical spike or inductively coupled plasma [ICP] serial dilution)
- M - Duplicate injection precision for GFAA analysis outside control limits
- N - Laboratory spike sample results outside control limits
- S - The reported value was determined by MSA
- W - Post-digestion spike for GFAA outside control limits

[b] Qualifier (Defined in U.S. EPA 1994. *Laboratory data validation: functional guidelines for evaluating inorganic analyses*. U.S. Environmental Protection Agency, Washington, DC):

- *J* - Estimated
- *R* - Rejected
- *U* - Undetected

Table 3. Sample identification

Sample Number	Sample Type[a]	Station	Sample ID	Subsample	Date	Time	Matrix	Tag Number	Analysis Type

[a] This table should include results for natural samples, field replicates, and field blanks. The type of sample (i.e., field replicate, field blank) should be included in the *sample type* column.

Table 4. Sampling coordinates

Locational Coordinates (State Plane northing/easting)	Error Associated with Horizontal Information	Error Associated with Elevation Information	Elevation	Elevation Reference	Height of Reference Above Ground	EPA Stream Reach

Attachment A

Laboratory Data Validation Checklist for Metals Analysis by ICP or GFAA

Attachment A
Laboratory Data Validation
Checklist for Metals Analysis by ICP or GFAA

Site: Case No.: Laboratory:
Project: Sample Matrix: Analyses:
Sample Dates: Analysis Dates:
Data Validator: Validation Dates:

---

1. Holding Times

Analyte	Matrix	Method	Holding Time*	Collection date	Analysis date	Holding time met? (Y/N)	Affected data flagged? (Y/N)

* cite reference for holding time

Were any data flagged because of holding time problems? Y____ N____

2. Instrument Calibration

Was instrument successfully calibrated at the correct frequency and with appropriate standards and blanks? Y____ N____
Was Initial Calibration Verification (ICV) performed? Y____ N____
Was ICV within control window of ___ to ___? Y____ N____
Were Continuing Calibration Verifications (CCVs) performed at the frequency of _____? Y____ N____
Were CCVs within control window of ___ to ___? Y____ N____
Describe corrective actions taken because of calibration problems _____
Were any data flagged because of calibration problems? Y____ N____

3. Blanks

Was Initial Calibration Blank (ICB) analyzed? Y____ N____
Was ICB within control window of _____? Y____ N____
Were Continuing Calibration Blanks (CCBs) analyzed at the frequency of _____? Y____ N____
Were CCBs within control window of _____? Y____ N____
Were Preparation Blanks (PB) analyzed at the frequency of _____? Y____ N____
Were PBs within control window of _____? Y____ N____
Describe corrective action taken because of blank problems _____
Were any data flagged because of blank problems? Y____ N____

4. ICP Interference Check Sample

Was ICP Interference Check Sample (ICS) analyzed at the frequency of _____? Y____ N____
Were ICS results within the control window of _____? Y____ N____
Describe corrective actions taken because of ICS results _____
Were any data flagged because of ICS problems? Y____ N____

5. Laboratory Control Sample

Was Laboratory Control Sample (LCS) analyzed at the frequency of _____? Y____ N____
What was the source of the LCS? _____
Were LCS results within the control window of _____ to _____? Y____ N____
Describe corrective actions taken because of LCS results _____
Were any data flagged because of LCS problems? Y____ N____

6. Duplicate Sample Results

Was Laboratory Duplicate Sample (LDS) analyzed at the frequency of _____? Y____ N____
Were results of LDS within the control window of _____? Y____ N____
Describe corrective actions taken because of LDS results _____
Were any data flagged because of LDS problems? Y____ N____

7. Matrix Spike Sample Results

Was Laboratory Matrix Spike Sample (LMS) analyzed at the frequency of _____? Y____ N____
Were results of LMS within the control window of _____ to ____? Y____ N____
Describe corrective actions taken because of LMS results _____
Were data flagged because of LMS problems? Y____ N____

8. ICP Serial Dilution

Was ICP Serial Dilution (SD) analyzed at the frequency of _____? Y____ N____
Were results of SD within the control window of _____? Y____ N____
Describe corrective actions taken because of SD results _____
Were any data flagged because of SD problems? Y____ N____

9. Graphite Furnace Atomic Absorption Quality Control

Was graphite furnace AA scheme followed? Y____ N____
Did duplicate injections agree within the control window of _____? Y____ N____
Were spike recoveries for PB and LCS within control windows of _____? Y____ N____
Were Method of Standard Additions (MSA) results correctly calculated, at the appropriate levels and were correlation coefficients > 0.995? Y____ N____
Were any data flagged because of GFAA problems? Y____ N____

10. Overall Assessment

Are there analytical limitations of the data that users should be aware of? Y____ N____
If so, explain: _____

11. Authorization of Data Release from the Laboratory

Laboratory Data Validator

Name: _____

Signature:_____

Date: _____

Laboratory QA Officer/Manager

Name: _____

Signature:_____

Date: _____

Attachment B

Laboratory Data Validation Checklist for Metals Analysis by Spectrace XRF

Attachment B
Laboratory Data Validation
Checklist for Metals Analysis by Spectrace XRF

Site:	Case No.:	Laboratory:
Project:	Sample Matrix:	Analyses:
Sample Dates:	Analysis Dates:	
Data Validator:	Validation Dates:	

---

1. Holding Times

Analyte	Matrix	Method	Holding Time*	Collection Date	Analysis date	Holding time met? (Y/N)	Affected data flagged? (Y/N)

* cite reference for holding time

Were any data flagged because of holding time problems? Y____ N____

2. XRF Quality Control

What sample preparation steps were performed (i.e., drying and sieving, grinding)? _____

Were the samples prepared according to the SAP? Y____ N____

Was energy calibration performed at the frequency of once per day? Y____ N____

Were initial and continuing calibrations performed at the frequency in Table 8-1 of the XRF LAP? Y____ N____

Were initial and continuing calibration results within control windows? Y____ N____

Was laboratory duplicate analysis performed at the frequency of 1 per 20? Y____ N____

Were laboratory duplicate results within control window of _____? Y____ N____

Was laboratory replicate analysis performed at the frequency of 1 per 20? Y____ N____

Were laboratory replicate results within control window of _____? Y____ N____

Was cross-contamination check sample analyzed at the frequency of 1 per 50? Y____ N____

Was cross-contamination check sample results within control window of _____? Y____ N____

Was sand blank analysis performed at the frequency of 1 per 50? Y____ N____

Was sand blank result within control window of_____? Y____ N____

Were any data flagged because of XRF analysis? Y____ N____

3. Overall Assessment

Are there analytical limitations of the data that users should be aware of? Y____ N____

If so, explain: _____

4. Authorization of Data Release from the Laboratory

Laboratory QA Officer/Manager

Name: _____

Signature: _____ Date: _____

Attachment C

Data Validation Checklist for Field Quality Control

Attachment C
Data Validation
Checklist for Field Quality Control

Site:
Project:
Sample Dates:
Data Validator:

Case No.:
Sample Matrix:
Analysis Dates:
Validation Dates:

Laboratory:
Analyses:

---

1. Holding Times

Analyte	Matrix	Method	Collection date	Analysis date	Affected data flagged? (Y/N)

2. Field QC Samples

Field Blanks

Were field blanks submitted as specified in the Sampling & Analysis Plan? Y____ N____
Were any data qualified because of field blank problems? Y____ N____

Field Replicates

Were field duplicates submitted as specified in the Sampling & Analysis Plan? Y____ N____
Were any data qualified because of field duplicate results? Y____ N____
Were results for field blanks within the target control limits in the CFRSSI QAPP? Y____ N____

Field Reference Materials

Were field Reference Materials or Performance Evaluation Samples submitted as specified in the Sampling & Analysis Plan? Y____ N____
Were the results within the manufacturer's control limits? Y____ N____

Attachment D

Level A/B Screening Checklist

Attachment D
Level A/B Screening Checklist

I. General Information

Site:
Project:
Client:
Sample Matrix:

II. Screening Results

Data are:
1) Unusable _____
2) Level A _____
3) Level B _____

II. Level A Screening

Criteria	Yes/No	Comments
1. Sampling date		
2. Sample team/or leader		
3. Physical description of sample location		
4. Sample depth (soils)		
5. Sample collection technique		
6. Field preparation technique		
7. Sample preservation technique		
8. Sample shipping records		

II. Level B Screening

Criteria	Yes/No	Comments
1. Field instrumentation methods and standardization complete		
2. Sample container preparation		
3. Collection of field replicates (1/20 minimum)		
4. Proper and decontaminated sampling equipment		
5. Field custody documentation		
6. Shipping custody documentation		
7. Traceable sample designation number		
8. Field notebook(s), custody records in secure repository		
9. Completed field forms		

Appendix A

Quality Assurance and Quality Control Review of Inorganic Data for _____ Investigation

Quality Assurance and Quality Control Review of Inorganic Data for _____ Investigation

A summary of the samples collected for this investigation is included in Table A-1. The analytical protocols used to obtain the inorganic metals data during the _____ Investigation included x-ray fluorescence (XRF) (Spectrace®), inductively coupled plasma atomic emission spectrometry (ICP), and graphite furnace atomic absorption spectrometry (GFAA) methods. The quality of the inorganic data is summarized in the paragraph below and discussed in this report and attachments.

Enforcement and Screening Quality Assessment

Enforcement quality data are supported by rigorous sampling and analysis procedures, quality assurance and quality control (QA/QC) protocols, and documentation requirements. Enforcement quality data include data that meet the Level A and B criteria (Attachment D) and are not qualified as estimated during the data validation process. In addition to the Level A/B assessment, the data are reviewed for qualifiers. Data that meet the Level A and B criteria and are free of qualifiers are assessed as enforcement quality. Of the _____ total data points for metals, _____ percent are qualified because of duplicate results, and _____ percent are qualified because of matrix spike results. _____results for this investigation are rejected. The analytical data and the enforcement and screening assessment will be presented in Table 1 in the main text of the report. Sample number codes and sampling coordinates at each station will also be identified in Tables 2–4 in the main body of the report.

Quality Assurance and Quality Control Review of Inorganic Data

Data validation checklists were completed by the laboratory(ies) for the _____ Investigation. The completed checklists are included in Attachment A. Laboratory flags and data validation qualifiers were assigned to selected results. Laboratory data flags and qualifiers are listed in Table A-2. This section should include a brief summary of the laboratory quality control results and results that were qualified during data validation.

Field Quality Control Samples

The frequency of field quality control as outlined in the quality assurance project plan (QAPP) (ARCO 1992c) and _____ Investigation sampling and analysis plan (SAP) will be discussed in this section. If sample results are qualified because of field quality

control results, a list or table of affected samples will be included in the appropriate field quality control section.

Field Blank Results

Results of bottle blanks, external contamination blanks, and cross-contamination blanks will be discussed in this section. The results will be summarized in Table A-3.

Field Replicate Results

Field replicates are used to assess field and laboratory precision. The field replicate results will be discussed in this section and presented in Table A-3.

Reference Material Results

The source of the standard reference material (SRM) will be identified and the frequency of analyses will be discussed in this section. Results of the SRM will be discussed in this section and also summarized in Table A-3.

Table A-1. Summary of _____ Investigation natural samples

Area	Total Samples	Analytical Parameters
Lower Works structural area		Total arsenic, copper, lead, zinc; soil slurry pH and conductivity
Upper Works structural area		Total arsenic, cadmium, copper, lead, zinc; soil slurry pH and conductivity
Hillside flue		Total arsenic, cadmium, copper, lead, zinc; soil slurry pH and conductivity
Waste piles		Total arsenic, cadmium, copper, lead, zinc; soil slurry pH and conductivity
Heap roast slag piles		Total arsenic, cadmium, copper, lead, zinc; soil slurry pH and conductivity
Red Sands area		Total arsenic, cadmium, copper, lead, zinc
Heap roast slag piles		Total arsenic, cadmium, copper, lead, zinc
Tailing ponds		Total arsenic, cadmium, copper, lead, zinc; EP Tox extraction for arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, nitrate-nitrogen; soil slurry pH and conductivity
Total		

Table A-2. Definitions of data flags and qualifiers for inorganic data

Type	Description	Value
Laboratory Flag[a]		
N	Laboratory spike sample results outside control limits	--
*	Laboratory duplicate results outside control limits	--
E	Sample results qualified because of interference (graphite furnace atomic absorption [GFAA] analytical spike or inductively coupled plasma [ICP] serial dilution	--
M	Duplicate injection precision for GFAA analysis outside control limits	--
W	Post-digestion spike for GFAA outside control limits	--
+	Correlation coefficient for Method of Standard Additions (MSA) for GFAA less than 0.995	--
S	The reported value was determined by MSA	--
Qualifier		
R [b]	Rejected	--
U [b]	Undetected	--
J [b]	Estimated	--

[a] Defined in U.S. EPA 1988. *Contract Laboratory Program statement of work. Inorganic analysis, multi-media, multi-concentration*. ILM04.0. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laborator, Las Vegas, NV. (Flags are assigned by the laboratory).

[b] Defined in U.S. EPA 1994. *Laboratory data validation: functional guidelines for evaluating inorganic analyses.* U.S. Environmental Protection Agency, Washington, DC.

Table A-3. Field quality control sample results

Analyte	Reference Material[a] True Value[a] (mg/kg)	Reference Material[a] Sample No.	Reference Material[a] %R[b]	Field Blank Sample No.	Field Blank Concentration (mg/kg)	Field Duplicate Sample No.	Field Duplicate Concentration (mg/kg)	Field Duplicate Sample No.	Field Duplicate Concentration (mg/kg)	RPD[c]
Arsenic										
Cadmium										
Copper										
Lead										
Zinc										

Note: RPD - relative percent difference

[a] Source is _____.

[b] %R - percent recovery $= \frac{\text{found}}{\text{true}} \times 100.$

[c] RPD $= \left| \frac{\text{sample-duplicate}}{\text{mean}} \right| \times 100.$